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EDITORIAL

SOMETHING IN THE MAKING

Ufology in Soviet times was essentially non-cumulative. One can discern in its history an evident "wavy" pattern: at first, a UFO pioneer, with a small group of adherents, tried to open society's eyes to real significance of the UFO problem; then, for a short time, the State and Party authorities looked at this attempt in dullish bewilderment; and finally, they realized their mistake and gave instructions to stop immediately this violation of common sense. In all, there were three big "waves" of such kind (dated 1961, 1967, and 1976).[1] During the short periods of half-tolerated existence of ufology in the USSR, there arose a small ufological community and some pieces of empirical information on UFO sightings and theoretical considerations accumulated in Samizdat manuscripts and very few publications. Between the "waves" the community quickly, though not totally, dissolved, and by the next "wave" practically everything had to be built anew.

Well, this was a sort of "external" non-cumulativeness, with an evidently "social" background. But as a matter of fact, the ufological movement which had existed in the rest of the world for almost 50 years under quite different social conditions, is also noted for its non-cumulative (if not just anti-cumulative) character. In this case — internal.

Until the late 1970's, the prevailing tendency in mainstream ufology was the desire to objectivize its empirical basis, that is to move from "stories" to facts. Emphasis was placed on CE–II and radar-visual (RV) UFO cases, as well as on searching for statistical regularities in the set of UFO reports.

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True, even then a peculiarity of these regularities was detected: their falsifiability. Not a "principal" one, which is, according to K.Popper, a necessary feature of "good science", but, alas, a factual falsifiability. In this connection, Pierre Guerin has formulated the "only law of ufology". It states: "In Ufology, any law is immediately falsified by subsequent sightings just as soon as it is formulated". Aime Michel, whose brilliant mind did not tolerate any established truths, amended this law with a few words: "... including Guerin's Law" — but did not falsify it, nonetheless.[2]

Whether this peculiarity of ufology is related to the not-so-mature state of its methodology, or to the not-so-regular nature of the UFO phenomenon, or to something else, it is hard to say, since nobody — to the best of my knowledge — tried to analyze this question in sufficient detail. But the failure of all attempts to "solidify" the empirical basis of ufology has greatly contributed — directly, or indirectly — to turning mainstream ufology towards principally soft data — that is towards "stories" as such, first of all the stories about abductions and UFO crashes.

The highest point and symbol of the current stage of ufology seems to be Roswell, especially (but not only) the famous alien autopsy film. Here we are by no means dealing with scientific research, rather with a sort of investigative journalism, a Roswell-gate. Scientific trends in ufology did not vanish completely (cf., for example, works of the Central European Section of MUFON), but they are, let's say, not dominant.

Is this "principal" deviation from hard data just an accident, or not? To what extent ufology may be considered as science in any definite sense of the word? "Strict" models of science, developed by philosophers and methodologists, are in fact not applicable to many established sciences, except for physics and some other advanced (and mathematized) disciplines. But if we turn to the somewhat old-fashioned and a little bit "too broad" (but nevertheless quite reasonable) division of sciences into two types: natural and historical (which goes back to the work of W.Windelband), then we can find that

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ufology is much nearer to the latter, than to the former. It deals with phenomena non-reproducible in experiment, which can be investigated only indirectly, post factum, via eye-witnesses' reports (which from time to time happen to be supplemented with radar data, photographs, and supposed landing traces). In relation to the investigator, a UFO event is always a past one (whether it occurred 10 days, or 10 years ago, is not a principal question). Attempts to find in these events any regularities (not to mention laws) are even less successful than attempts to find such regularities in the history of human civilization (one should probably think about a version of "Guerin's Law" for the latter as well).

So, ufology is a "historical" science even if the UFO phenomenon is purely natural (something like "super-ball lightning"). If it does contain a "subjective" (alien) component, the latter will certainly add "lawlessness" to its picture. Does it mean that the investigator has to take the situation for granted and give up all attempts to find solid ground in this marshy field? Jacques Vallee once exclaimed: "Where are the UFO detectives?!"[3] They have appeared... and brought ufology into the deadlock of Roswell.

The "journalistic" (and "detective") character of contemporary ufology shows itself, among other things, in constant renewal of its empirical basis. Any old case, lesser in scale than a saucer crash, gradually falls into oblivion, even if well-documented and unexplained. For a "historical" research discipline, it is a principally incorrect approach. As an example, let us consider the so-called "Petrozavodsk phenomenon" that is discussed in the paper by L.Gindilis and Yu.Kolpakov, included into this RB issue. In 1977 it was a really epoch-making event, for two main reasons.

First, by an oversight of Glavlit (the Soviet censorship) it was published in a few all-Union newspapers and hence became widely-known.

Second, it made the authorities of the former USSR understand that the UFO phenomenon is not just an invention of irresponsible saucer buffs. As a result, the military and science bureaucrats were charged to look into the question.

This decision did *not* make life easier for Soviet UFO amateurs; quite the reverse — it aggravated censorial prohibitions, making almost impossible even "low profile" ufological activities.[4] But this (even relative and half-secret) "officialization" of the UFO problem has partly broken the then-dominant tendency of superficial and incompetent negation. The "waves" have stopped; the level of analysis of the UFO problem has radically altered.

It is important to remember that the Petrozavodsk phenomenon, as one can conclude from the paper by L.Gindilis and Yu.Kolpakov, is essentially anomalous. Absolutely anomalous? Of course, not. We cannot rule out the possibility of some rare (but explainable in terms of modern physics) large-scale atmospheric processes, triggered by ordinary technical experiments. But to treat this phenomenon just as a misinterpreted launch of an artificial satellite would be at least naive. The Petrozavodsk phenomenon is a significant part of the "ufological jig-saw puzzle" (this metaphor was very popular in the early years of ufology, and it is still quite meaningful).

Does all the above-said mean that the Roswell case is unimportant? Not at all. There certainly are some big lies on the part of the American military and *some* enigmas.[5] But whether these lies are really connected with the UFO problem, remains, to my mind, an open question. If the "Roswell crash" is for real (and it can be proved), this will be the most important stage in the history of the problem, but not its final (rather — its "real beginning"). If, on the contrary, all this story is just a "gumboil", swollen and overshadowing almost the whole UFO problem, it should be allowed to come to its natural end.

Modern science has in fact many methodological limitations, both justified and far from it. One of the latter is probably its evident tendency to work "with experiment", not directly "with nature", using experimental results as a basis for the scientific picture of the world. This is quite understandable — since the ultimate aim of modern science is to create useful artificial systems and processes ("engineering" in the broad sense of the word), not just to explain natural phenomena. The atomic bomb, microprocessors, space rockets, and other technical achievements are not by-products of science, but a "concentrated" manifestation of its essence at the current stage of its development. In *this* sense science is very effective, and scientists may certainly be praised in this connection. But ufologists (even taking into account their regrettable inclination to resort to the ET hypothesis more often than needed) are to a greater degree *naturalists*, successors of those savants who studied lightning, meteorites and volcanoes and created herbaria, than the modern experimenters. Yes, the latter build a reliable factual foundation for rigorous mathematized theories, but events non-reproducible in experiments are, as a rule, ignored, discredited, or at best bashfully veiled. Ufology (and anomalistics in general) is more trusting as regards reality, which is not always a drawback.

On the other hand, UFO "stories", even corroborated by instrumental data (RV) or material traces (CE–II), cannot probably give us a basis solid enough to build on it a rational model of the phenomenon (nor, probably, can they supply us with a representative subset of true UFO events). Hence, like the well-known Roman senator who availed himself every good opportunity to remind his audience that Carthage must be razed to the ground, I would like to repeat:[6] there is a strong need to move from collecting accidental stories to an active and systematic search for hard data on UFOs in the atmosphere and near space. Only the results of such work (if any) will lay the real empirical foundation for the discipline of ufology.

(Continued on page 12)

THE PETROZAVODSK PHENOMENON

L.M.Gindilis and Yu.K.Kolpakov

The present paper was basically written in 1978, quite soon after the observation and investigation of the "Petrozavodsk Phenomenon". It was intended for the "Priroda" journal, published by the USSR Academy of Sciences and was entitled "Anomalous Atmospheric Phenomena. The Phenomenon of September 20, 1977". We believe that the journal's editors were really interested in publishing the paper; however they could not overcome the censorial restrictions of those days. During the past years, in our opinion, there have not been obtained any essentially new data to alter description and interpretation of the observations. For this reason, we have left the paper principally "as it was". Here we have only omitted the concluding section of the paper which described some other anomalous phenomena (AP) and characterized the AP problem in general. This does not seem topical at present. We have also made minor correction of wording.

General outline of the phenomenon

At night, early on the 20th of September of 1977, over a vast area in the north-west of the European part of the USSR, unusual light phenomena in the atmosphere were observed, namely formation and motion of bright luminous bodies surrounded by extended shells and emitting light rays or jets of quaint shapes. The shells transformed and diffused within 10 to 15 minutes. Besides, a more long-lived, stable glow was observed, mostly in the north-eastern part of the sky. These phenomena took place during disturbances of the geomagnetic field and the upper atmosphere. Somewhere aurora borealis was seen.

The phenomenon was witnessed by workers of the Hydrometeorological Service, civil aviation, marine, railway, militia*, ambulance, military men, construction workers, scientists, etc.

The USSR Academy of Sciences and other organizations received a lot of reports. Below we describe the phenomenon on the basis of these data.

The area of the observations

Figure 1 shows the sites of observations. They are scattered over part of the Kola Peninsula, Karelia, the Leningrad and Pskov Regions, Estonia, part of Byelorussia. As was reported by the press of Finland, this phenomenon was observed over Helsinki and near Turku. No observations in the Arkhangelsk Region were reported, though the weather conditions (the state of the atmosphere) did not differ much from those in observation areas. At some weather stations in the Arkhangelsk Region was observed aurora borealis, but no unusual phenomena.

Outside the area described, unusual light phenomena, as reported by eyewitnesses, took place in Tbilisi, Ochakov, the Chelyabinsk Region and over the Altai Mountains. There also were reports of observations from airplanes over central areas of the European part of the USSR and over Copenhagen (according to Finnish press). It remains unclear if and to what degree these occurrences were related to the phenomenon under consideration. Though, it should be noted that the time and character of the events in the Chelyabinsk Region (the town of Troitsk) are close to those of the main phase of the phenomenon observed over the north-western areas of the USSR. Below, unless other specified, we shall mean only the latter.

The time of the observation

The phenomenon lasted from 3 a.m. to 6 a.m., Moscow time. Three phases may be distinguished in it.

The **first** one took the period of time approximately till 4 a.m.; isolated observations were made at some sites indicated in Fig. 1. These did not coincide in time and were little similar in appearance. The **second** phase embraces a much larger number of sites. At all the sites (maybe with one or two exceptions), practically simultaneously, within a few minutes, similar (though not totally identical) phenomena were observed. Most of the 120, or so, reports considered in this paper belong to this phase. We call it **the main phase** of the phenomenon. It began at 3.55 or 3.57 a.m. and lasted for 10 to 20 minutes. The next, **third** phase that lasted till daybreak was characterized by stable radiance, mostly observed in the north-east. At some sites, during this phase, motion of luminous bodies was seen.

Description of the phenomenon based on visual observations

The first phase. As has been noted, during this phase only isolated observations took place. This enables but a brief review of the phenomena observed. Note that the following characteristics refer only to *visible* motion.

About 3.00 a.m., inspectors of Leningrad commercial port noticed in the north-eastern part of the sky a bright oblong body emitting beams of light in all directions. There were five bright light arcs around the body which rose from the horizon to the sky in various directions. In this observation were used 9× binoculars. The body slowly moved towards the horizon and, approximately 25 min. later, disappeared behind the roofs of buildings on the right bank of the Neva. The luminous arcs gradually faded and disappeared too. Approximately at the same time an inhabitant of Leningrad, O.P.Kupriyanov, saw a flying body with a pronounced core and a trident-shaped tail.

At 3.10 to 3.20 a.m., in the town of Kirovsk on the Neva, there was seen a lenticular-shaped body, its

*This Russian term designates the police, *not* a military force composed of reservists.

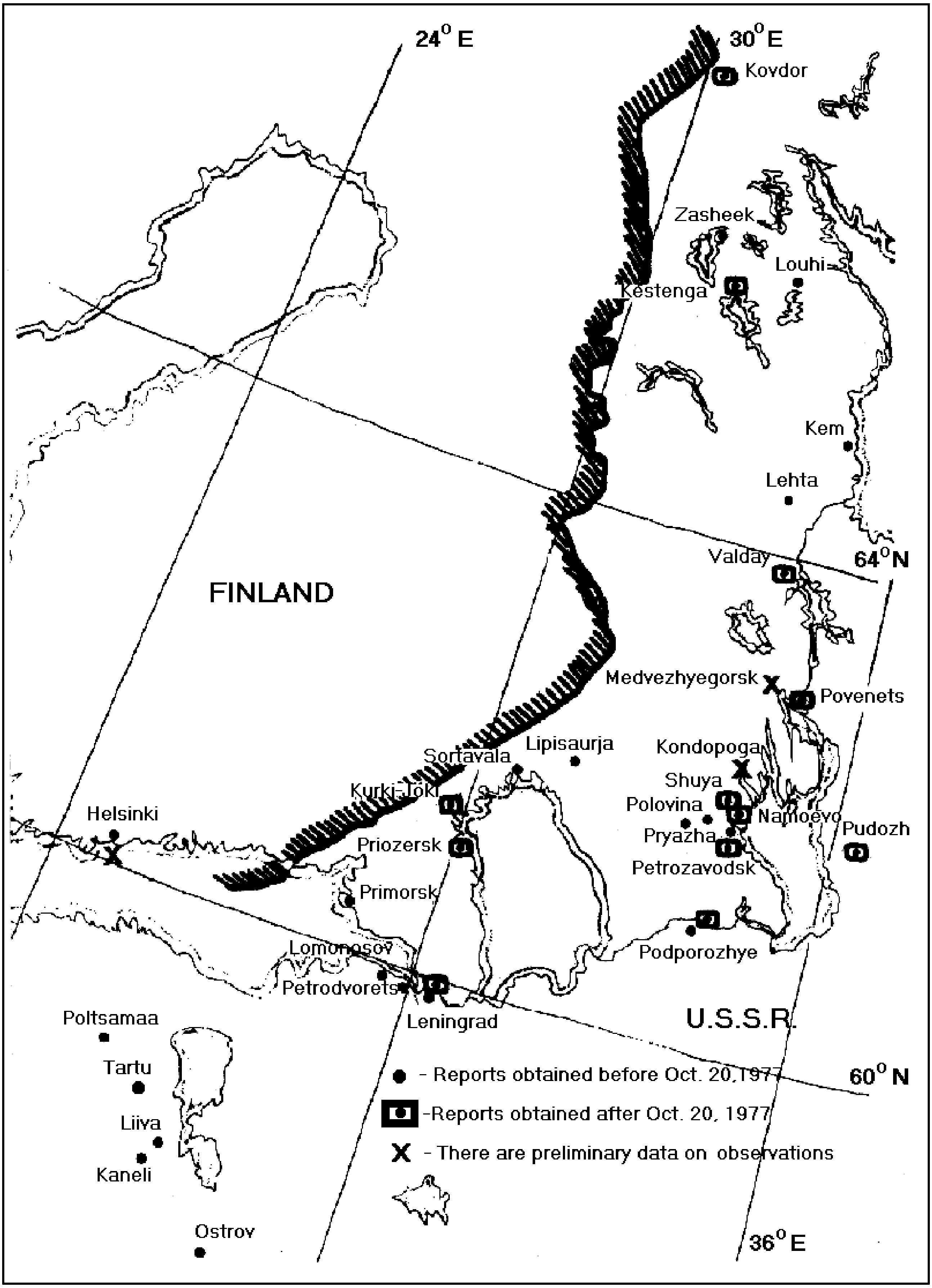


Fig. 1. Observation sites.

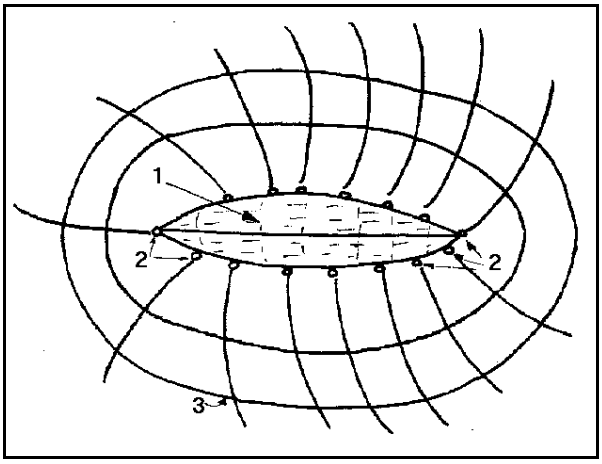


Fig. 2. Yu.V.Linnik's observation in the village of Namoevo: 1 – the central lenticular body of the dark amethist color intensively illuminated from the inside (a reticular or lattice structure of the surface was noted); 2 – red dots rhythmically issuing rays; 3 – the lusterless ring, its distance to the central body being strictly constant.

angular dimensions being around 5 minutes of arc, that flew in a rather complicated path. A similar object was observed about the same time by Yu.V.Linnik in the village of Namoevo near Petrozavodsk (fig. 2). He used an amateur telescope with magnifications 30× and 80×. The object described a large arc on the celestial sphere, approximately from the east to the west. The eyewitness noticed (without much confidence) oscillations in the motion of the body with respect to its middle path. Near the star gamma Cephei, with the angle of elevation about 70°, the object seemed motionless for some time. Near the star kappa Coronae Borealis, the direction of its motion altered. Shortly after this it disappeared from the horizon. The duration of the observation was 15 to 20 minutes.

At 3.30 a.m. the crew of the fishing vessel "Primorsk" saw, when departing from the wharf of the seaport of Primorsk, a swiftly moving and brightly luminous body, or rather a point-like source of light surrounded by a luminous shell. The body was moving from the east; near the town it suddenly, almost at a right angle, turned and went to the north. It left behind it a luminous trace which gradually dispersed. As in the above cases, this process was noiseless. The eyewitnesses noted (without confidence) the smell of ozone. Some time later, a second body was observed: "a descending object" of a spherical shape, periodically illuminated (or luminous) on the bottom. This object was observed through binoculars and disappeared somewhere behind the forest in the environs of Primorsk.

Finally, between 3.00 and 4.00 a.m., research worker of an expedition of the Polar Geophysical Institute A.K.Dudakov in the settlement of Kovdor of the Murmansk Region observed motion of two luminous bodies in a quite clear sky. One of them was seen at the angle of elevation of 45°; it represented a point-like object, with a gradually developing wide tail. The body was moving approximately from the east to the west, in an ascending path. Near zenith it began to decline to the north, so that the final direction of motion became north-west. As this took place, there appeared near the first body a second, scarcely noticeable point, which became brighter and bigger, as the first one gradually faded. Both the bodies moved along the same path, though the second one slightly slower, so that the distance between them gradually increased. Before long, the first point lost all its brightness and ceased to be seen, while the second one grew into a dim spot which faded as it widened. Then its brightness gradually became equal to that of the much faded tail of the first body. No aurora borealis was observed during this phenomenon.

The second phase. Because of the large number of reports concerning this phase, it is impossible to review all observations even briefly. Thus, we have to restrict ourselves to outlining a certain generalized pattern. It should be borne in mind that the complicated and dynamic picture of the phenomenon was not quite the same in various areas. Two areas may be distinguished in this respect: 1) southern Karelia (including the city of Petrozavodsk and its environs), and areas adjacent to it on the south-west; 2) central and northern Karelia.

Let us see how the phenomenon proceeded in the former area. At various sites its look certainly depended on the foreshortening and other conditions. Besides, the eyewitnesses saw it at different phases of the swiftly developing picture. And finally, for quite subjective reasons, they fixed on different details. It is no wonder therefore that not all details of reports of eyewitnesses (who viewed it even from the same sites) completely coincide. Still, the principal, essential features of the phenomenon are well traced over most of the reports. In this sense, the eyewitnesses' reports are in good agreement, complementing each other. On this basis we can form the following outline of the main phase (within the area under consideration).

About 4 o'clock, Moscow time (according to records of the Pulkovo airport of Leningrad, this was 3.55 – 3.57 a.m.), in the north-east part of the firmament, a brightly luminous spherical body appeared, smaller than the lunar disk, its glow being white (maybe slightly reddish). The body ascended approximately NNE to SSW. As it moved upwards, a semi-transparent shell of bright white color formed around it. The shell grew in size; though, its brightness did not change, as it seems. At a certain elevation (which was different as viewed from different sites), the body, together with the shell, stopped or much slowed, so that was seen as motionless. At this moment the shell became maximal in size, of the order of several degrees. It was circular or oval in shape. The eyewitnesses compare it with an open umbrella or parachute. The most impressing stage in the evolution of the shell was probably formation of a very bright "radiant" or "jet" structure. It consisted

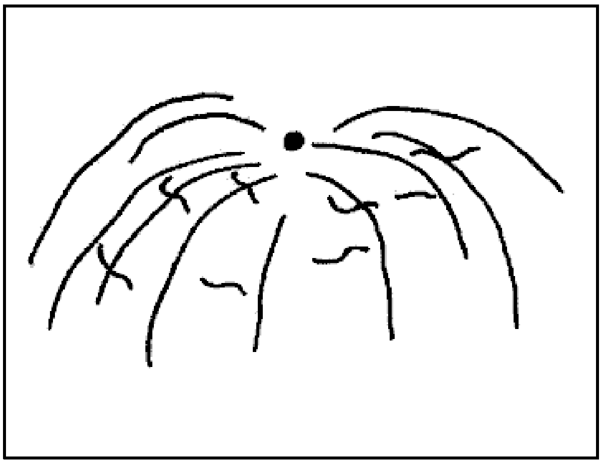


Fig. 3. Formation of a radiant structure at the stage of hovering, as represented by A.Antropov, Petrozavodsk.

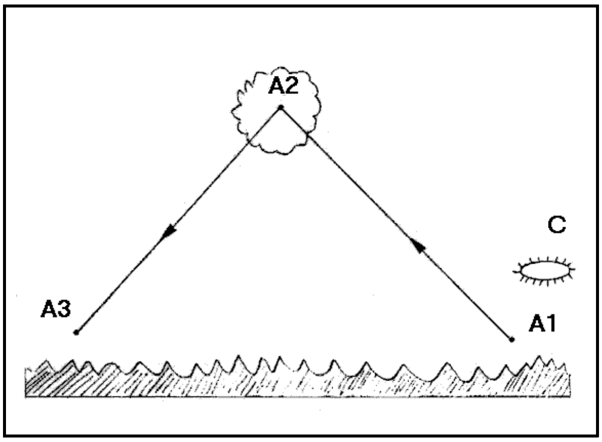


Fig. 4. A diagram of the phenomenon, according to A.G.Mezentsev, Petrozavodsk (scenario 1).

of bent "rays" contacting in the central body or issued by it (fig. 3). They could be jets of luminous matter. The glow issued by the shell (some eyewitnesses called it figuratively "light rain") spread over considerable part of the sky. As compared to the reddish central body, it was white-blue. Eyewitnesses in Leningrad, Petrozavodsk and some other points noted a peculiar character of this glow. It, as it were, propagated along the rays like running lights of an electric sign, producing impression of pulsation of the whole shell. Some observers noted rhythmical variations of the radiation in the position angle.

The "hovering" stage lasted for a few minutes. Before it ended, the radiation disappeared; a dark zone formed around the central body; then the body began to move at an angle of approximately 150° to the direction of previous movement, and went flying to the north with acceleration. The shell stayed where it was, gradually becoming thinner.

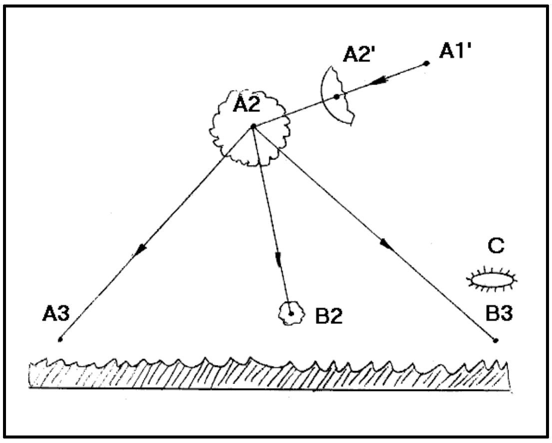


Fig. 5. A diagram of the phenomenon, according to A.G.Mezentsev, Petrozavodsk (scenario 2).

All eyewitnesses, with one exception or two, noted total absence of sound. An essential feature is high illumination level of the earth's surface by the object. Many witnesses first noticed bright illumination ("suddenly it became light"), and only then caught sight of the body in the sky. This light was noticeable even in houses. This is reported by observers from Leningrad, Helsinki, Gomel, Petrozavodsk. It seems that illumination was not lower than that of a full moon.

At the moment of departure of the body, to the east of it, at a low altitude there appeared a large light oval spot which was there till daybreak, remaining stable and motionless (third phase). This glow was observed in Tallin, Leningrad, Petrozavodsk, as well as at some other points. In Podporozhye it was seen against quite clear sky; in Leningrad and Petrozavodsk against clouds low above the horizon. For some of the observers the direction to this "glow" coincided with that of departure of the main body, and as a result they had an illusion of formation of the glow after the body entered the clouds.

This is the general picture of the phenomenon. Certainly it is only a simplified outline. Some features reported by witnesses have not been mentioned here. For example, besides the jet-like structure, straight light rays were seen similar to those of searchlights; there have been independent reports (from different places) of several point light sources near the lower edge of the shell. Some other features that seem at present dubious (which we do not dwell upon) may also prove one day essential to characterize the whole phenomenon.

A very important question is that of the number of the objects observed. According to A.G.Mezentsev [1] who systematically questioned witnesses in Petrozavodsk and its environs, the synthetic picture of the phenomenon based on a large number of accounts looks more complicated (fig. 4). The reports of witnesses can be subdivided into two groups which suggest two distinct "scenarios" of the phenomenon. One of them coincides with the above picture. In fig. 4 it is represented by the A1–A2–A3 line; the A2 position corresponds to the stage of hovering with a well-developed extended shell. According to the other scenario (fig. 5), instead of the ascending object A1, there was a descending object A1' looking like a bright white

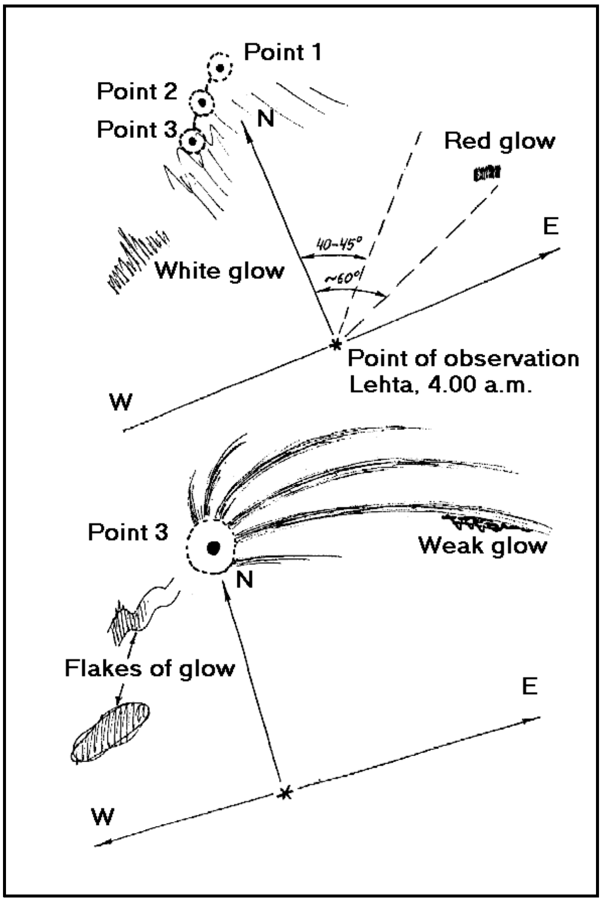


Fig. 6. The phenomenon as seen by workers of the Leningrad Branch of IZMIRAN near Lehta, as represented by Yu.A.Kopytenko.

sphere with the angular size considerably smaller than that of the moon. It passed by the zenith and, in the plane of projection, moved slowly downwards. The asymmetric glow began to spread from it (A2'), the object slowed its motion or even "stopped" (A2). The surrounding shell widened and became more symmetric, resembling a flower or a parachute of a milk-white color. This stage is the same in both scenarios. Subsequently, according to the second scenario, the body divided into three bodies. Two of them went beyond the horizon at the points A3 and B3, while the third body, slowly moving downwards and to the right (in the plane of projection), disappeared at the point B2 with formation of a small cloud. The shell A2 stayed where it was and gradually diffused. To the right of A2 there arose glow (C) which was seen till daybreak: this stage also coincides in both scenarios.

It should be noted that scenario 2 (as well as scenario 1) is a generalized representation. As for the concluding stage (departure of the body), few are witnesses who saw recess of three bodies in three directions. Most of them report of two bodies and accordingly two directions. Eyewitnesses of the first group (scenario 1) report of only one body. It is probable, A.G.Mezentsev says, that some bodies were just invisible from certain places. The A2–A3 line representing the stage of hovering of the body with its subsequent departure to the north seems to be trustworthy. Other features of the synthetic picture are less reliable.

There is some evidence for two simultaneously observed objects which were moving in one direction. These could be parts of the same body. Besides Petrozavodsk, this was noted in Leningrad (without full confidence), in Podporozhye, as well as at some other points.

Although the picture of the phenomenon varied with site of observation, the following common features can be noted: 1) a bright core of a spherical shape; 2) formation and evolution of a semi-transparent expanding shell of a spherical or oval shape; 3) a developing radiant or jet-like structure (with bright light rays in some cases); 4) high illumination level of the ground by the object (interestingly, clouds, when screening the body, were brightly lighted); 5) movement with altering course, hovering; 6) recess of one object to the north; 7) total silence during the flight of the body.

As has been mentioned, in northern and central regions of Karelia the phenomenon proceeded somewhat differently. It seems that several luminous bodies (observed simultaneously or almost simultaneously) were characteristic for these regions. A very complicated picture of formation, evolution and motion of the bodies was seen by the husband and wife Isaevs in the region of Louhi. As was observed by research workers of the Leningrad Branch of the Institute of Terrestrial Magnetism, Ionosphere and Radio Wave Propagation of the USSR Academy of Sciences (IZMIRAN) in the region of Lehta, the phenomenon developed as follows (fig.6). About 4.00 a.m., Moscow time, in the northern part of the sky, in the direction of the magnetic meridian, they observed formation and evolution of three luminous star-like objects with the angle of elevation of 30°–40°. The first object grew within a minute into a luminous sphere of about 20 minutes of arc in diameter which soon diffused leaving no traces. Approximately 15 s after this, slightly below the first object, a second point object appeared which slowly moved to the NNW. This one also grew into a sphere and then transformed into a dome that divided into three thin white strips outstretched to the north. The evolution of the object took two to three minutes. Approximately one minute after appearance of the second object, there appeared a third one to the NNW of it. Unlike the first two objects, it remained motionless, also spreading into a white luminous sphere. This sphere having diffused, there appeared in the north-eastern part of the sky long white strips, like a fan protruding from where the sphere had disappeared. Those closer to the north were shorter, and those closer to the east longer. The longest one protruded far away to the east. This picture, as the observers believe, was similar to a corona-like aurora borealis. The whole phenomenon lasted for about 10 minutes.

Simultaneously, in the west, north-west and east, an aurora borealis was seen. An especially interest-

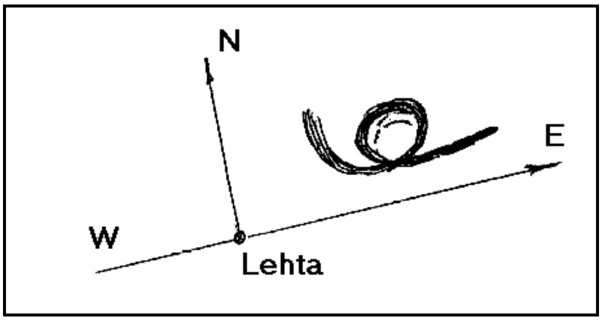


Fig. 7. The loop-like glow near Lehta, as represented by Yu.A.Kopytenko.

ing picture was in the north-east at the azimuth of about 60°. A loop-like glow gradually developed from aurora borealis and was observed till about 5.15 a.m., stable all the time (fig. 7). The glow was seen even at daybreak. In settlements Zasheek and Kestenga the movement of luminous bodies was observed at about 4.30 a.m., that is later than at other sites. These may belong to the third phase of the phenomenon.

The third phase. To this we attribute the light phenomena which were observed after the main body (the luminous core that had generated the ray structure) disappeared from the horizon and the remains gradually diffused. This phase lasted from 4.20 to 6.00 a.m. As has been said, it was characterized by stable and lasting glow with predominant red color; it was seen low in the north-east (fig. 8). At some points, more light-colored features were seen against its background which looked like a trail of a jet plane. From time to time these formed fairly quaint shapes. In the settlement Valday (Karelia) and in the region of Petrodvorets (near Leningrad) the glow was seen in the north-west. At some sites, flight of luminous bodies took place in this period of time. The whole set of unusual light phenomena lasted till dawn. In Petrozavodsk, aviation meteorologists remember unusual color of clouds at dawn: a bright light-blue strip of clouds in the east and a mass of pink clouds in the west.

Instrumental observations

Except a few observations through binoculars and one through a telescope (Yu.V.Linnik), all observations were made with the naked eye. In Lehta workers of an expedition of the Leningrad Branch of IZMIRAN managed to take several color slides with an amateur camera.

One of the phases of the phenomenon was photographed with C–180 all-sky cameras simultaneously at three stations: Sodankyla (Finland), Loparskaya and Voznesenye. The duration of this stage was from 4.04 to 4.09 a.m. A luminous object consisting of a core and a shell appeared suddenly before the cameras, moving northwards. Its shell swiftly broadened, developing ray-like structure. At 4.09 a.m. the object disappeared. In Sodankyla at this time a very intense aurora borealis was seen.

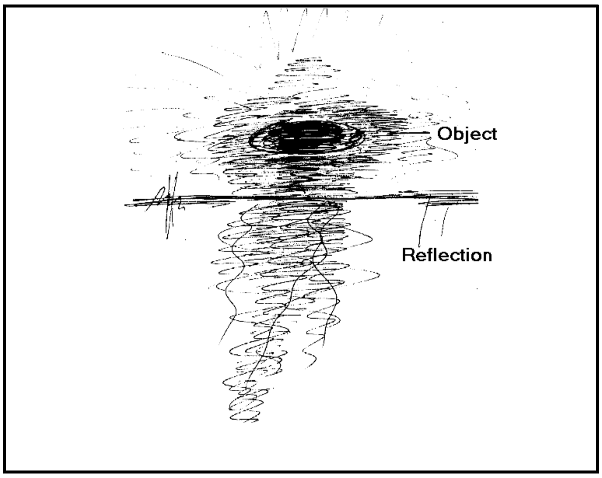


Fig. 8. The stable glow (third phase of the phenomenon), as represented by A.Silkin, Petrozavodsk.

Unfortunately, we have no negatives. By the photographs we have at our disposal, the altitude of the object can be estimated as 200 ± 50 km, the linear dimensions of the shell (180 ± 40)× (260 ± 60) km, its vertical size some 80 km, and its core size 20 km. These figures are certainly very rough; a more detailed analysis (using the negatives) could improve them substantially. But since the altitude of the earth shadow over this site was 130 km, one can at least conclude that the object was illuminated by sunlight.

The above picture describes only one of the stages of the phenomenon under consideration: it will be hereafter denoted by S. We will discuss below, how it is related to other phases of the phenomenon and to what extent it is responsible for the data of visual observations.

Another important thing about the phenomenon is that it was not detected by airdrome radars.

Conditions surrounding the development of the phenomenon

The heliographic conditions. As has been mentioned, the phenomenon of September 20, 1977 took place during disturbance of the geomagnetic field in the upper atmosphere.

On the preceding days (September 16, 17, 18, and 19), were registered solar flares. They induced geomagnetic disturbances. Since the 15th till 18th of September the magnetosphere was quiet, and on the 19th to 21st of September it was moderately disturbed. On the 19th of September, at 2.00 p.m., Moscow time, there began an SSC-type magnetic storm (with an abrupt onset). According to the data of the geophysical station in the settlement of Lehta, about 4 a.m. (Moscow time) on September 20, when the phenomenon took place, a strong magnetic storm with several substorms was recorded. The instrumental readings went frequently off-scale.

On September 17, 18, and 19–21, two heavy invasions of solar protons were registered. The average effective duration of the invasion was

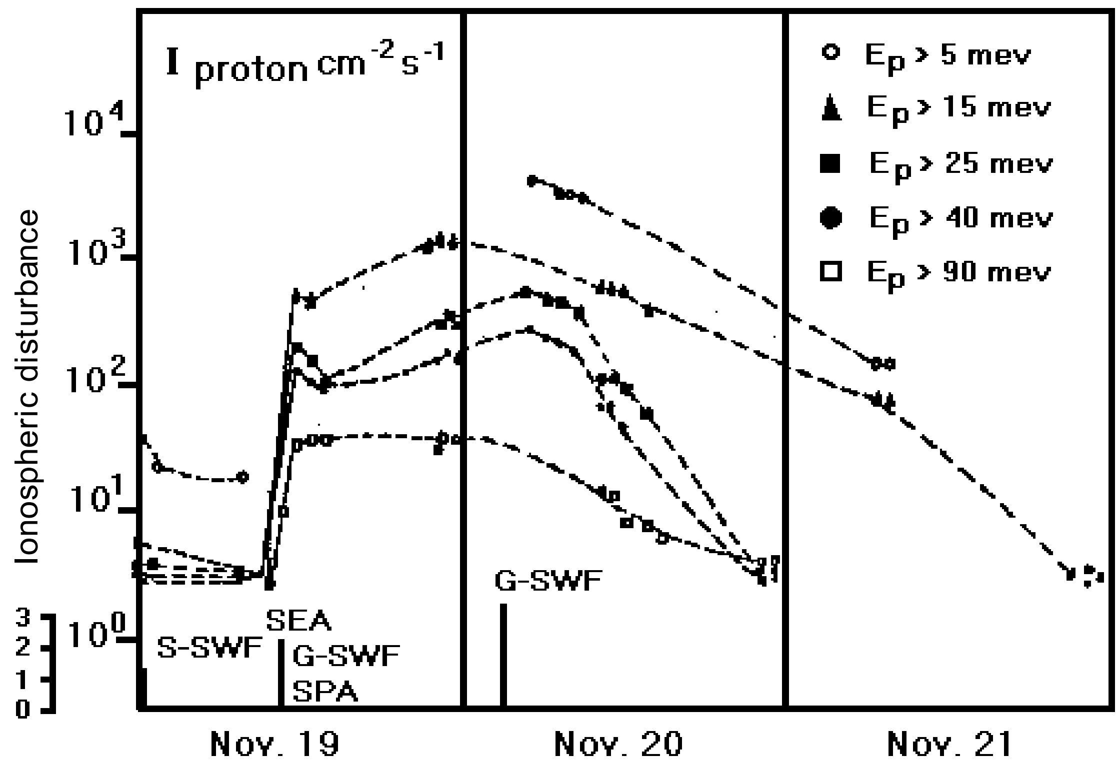


Fig. 9. The proton flux on September 19–21, 1977 (according to N.K.Pereyaslova).

two to three days. The maximum proton flux, on September 20, was approximately from 3 a.m. to 12 a.m. of Moscow time (fig. 9).

The invasion of particles caused aurora borealis. These phenomena were observed at night on the 20th of September in Finland, Karelia and the Arkhangelsk Region. In Sortavala, an aurora borealis was observed two hours before the onset of the active phase of the phenomenon under discussion. In Lehta this was seen during the main phase.

The solar flare of September 19 was attended by considerable increase of the X-ray flux and also bursts of radio-frequency emission. There were also disturbances in the ionosphere: a sudden increase in atmospherics, collapse of short-wave communication, phase anomaly.

A very interesting effect was observed by radio astronomers of the city of Gorki (now Nizhniy Novgorod). Several hours before the main phase of the phenomenon, at the observation station of the Research Institute of Radiophysics (NIRFI) in the Crimea a powerful pulsed radio-frequency emission on the wavelength about 50 cm was recorded.

Active processes in the Sun and in the Earth magnetosphere and ionosphere continued also after the phenomenon of September 20–21.

The meteorological conditions in the regions of observation depended on a high cyclone, its center over the Kara Sea. On its edge, minor cyclones moved which caused abrupt weather alterations. Over the most part of Karelia and the Leningrad Region the weather was unstable. In Leningrad, about 3 a.m., it was showering for a short time, in Petrozavodsk it was snowing from 2 to 3 a.m., after which the sky largely cleared.

The data concerning wind are also important. Close to the surface there was alteration of weak northern and western winds. However, above approximately 700 m, up to the altitude of 30 km, over Finland, Karelia and the Leningrad Region there was a great flow from the north to the south. The wind velocity was about 70 km/h at the altitude of 1.5 km and 180–190 km/h at 7–9 km. No thunderstorms were noted.

Meteor showers. As regards these, the date of September 20 is not noteworthy. The regular meteor shower nearest in time, viz. Perseids, was observed in the period from the 25th of July to the 18th of August and the next one, Orionids, from the 18th to 25th of October.

Discussion

As is seen from the above description, the phenomenon, complex as it was, included several stages and was characterized by some local features. The most important parameter to understand the nature of the phenomenon is the spatial position of the luminous bodies. If we had known it with sufficient accuracy, we would have been able to estimate the altitude over the earth surface and the linear dimensions of the

bodies. Unfortunately, this cannot be done reliably enough.

In respect of objects observed during the **first phase**, their spatial position cannot be determined, because in this case we deal with separate observations at seemingly different moments. Note that in Namoevoand Kovdor the luminous bodies traversed close to the zenith, that is just over the settlements, though their altitude remains uncertain.

The **second (main) phase** of the phenomenon is more favorable for analysis. The fact that during this phase luminous bodies were observed practically simultaneously at different sites may suggest that we deal with the same object which was at a high altitude of hundreds of kilometers. The stage of hovering with a well-developed shell was characteristic and common to many observations. It would seem to enable determining the position of the object at this stage by the parallactic method (cross-bearing from different points). Unfortunately, there are very few reliable directions measured (angles of elevation, azimuths), and these are not sufficient to make up a consistent space picture of the phenomenon making due allowances for the whole set of observations. Data taken at individual points are more definite.

In Petrozavodsk, the position of the object at the stage of hovering was determined on the basis of theodolite measurements, by questioning eyewitnesses. With the data of questioning of more than 50 witnesses from various parts of the city and its environs, A.G.Mezentsev attained the following spatial position of the object: the azimuth from the city center of 40°, the distance of 19 ± 10 km, and the altitude of 6 to 9 km. This result seems statistically reliable. Several eyewitnesses indicated the position of the object with respect to stars, which permitted independent determination of its coordinates: azimuth of 44°, distance of 11 km, and altitude of 6 km. An additional argument in favor of the close position of the object is an appreciable parallax with respect to motionless glow in the north-east: at some points in the city the glow was seen in the direction of departure of the body, and at other points it was seen to the right of it. A low altitude of the object is also suggested by the high illumination level of the earth's surface in the area which in some cases was as it were of a local character.

The result obtained is in agreement with the relative angular dimensions of the object as observed from Petrozavodsk and Pryazha. Near Pryazha a luminous circle of white color, of a diameter of about 2°, with a red dot at the center was seen. Identifying this circle with the white luminous shell and the dot with the core of the object observed in Petrozavodsk, the altitude can be estimated as several kilometers. Interestingly, as witnessed by D.A.Reutov (Pryazha), the shell which stayed after departure of the body broadened and moved over the man, and stars were seen through it. This also seems to suggest a comparatively close distance.

In Leningrad, where there are also many eyewitnesses, theodolite measurements were not made. For this reason, the altitude of the object can only be estimated on the basis of indirect data. Thus, for example, in Lahta (near Leningrad) the luminous body was seen close to the horizon, while at the Pulkovo airport it was seen at 60°– 80° above the horizon. So large a difference can hardly be due to errors of measurements, even remembering the common overestimation of elevations by eye. On the other hand, if this difference is real, it points either to the fact that different objects were observed, or to a considerable parallax of the object as observed from Pulkovo and Lahta, the altitude being thus several kilometers. This agrees with Z.L.Stein's testimony who observed the phenomenon near Petrozavodsk under total cloud cover, that is below clouds, and that of N.A.Korsakov (the settlement of Ermilovo in the Leningrad Region), who insisted that the object was flying below clouds. Observational data obtained from airplanes also suggest the altitude within 10 km above the earth's surface.

At the same time, as we have mentioned, the altitude of the object at the S-stage was approximately 200 km, in evident contradiction to the above data. Let us discuss the problem of the S-stage and its relation to other phases of the phenomenon.

It is most probable that this stage is related to observations of effects that attended launch of the "Kosmos–955" satellite. However, it is surprising that there were no reports of observations of this stage of the phenomenon in the vicinity of its location. Certainly, the absence of reports does not testify to absence of observations. One of the causes might be the short time that this stage took. Another cause might be large extension of the glow across the sky. In cloudy weather, the outline of the glow could be partially behind clouds, the whole phenomenon thus taken as short-time increase of the sky brightness, which could not be noticed, where northern lights are a usual thing. It is more difficult to account for the absence of observations at farther *eastwards* locations (in particular, the absence of data on the phenomenon from the Yugorski Shar Strait, where routine geophysical measurements were under way early on September 20). The surprising thing is that all sites at which the phenomenon was observed, are situated to the *west* of the S-body, as if its radiation was anisotropic.

Let us now consider the relation of the S-stage to other stages of the phenomenon. Certainly, this stage cannot account for the whole complex of phenomena of September 20. It lasted only for a few minutes. Meanwhile, invasion into (or formation in) the atmosphere of luminous bodies over a vast part of the Russian South-West took place over the course of two hours, from 3 to 5 a.m. It is tempting to correlate this stage to the main phase of the phenomenon which began about 4 o'clock. However, there is not complete coincidence even in this case. Indeed, the S-stage started at 4.04 a.m., while the main phase of the phenomenon at 3.55 to 3.57 a.m. This time was fixed by the duty operators of the Pulkovo airport. Since in this period of time they

communicated with airplanes, it is doubtful that the moment could be determined with an error of 7–9 min. There are also other pieces of evidence that the main phase began before 4.04 a.m., or even before 4.00, but this evidence is somewhat less reliable. On the other hand, the duration of the main phase was probably 10 to 20 min., also longer than that of the S-stage. Still, the S-stage did take place *during* the main phase of the phenomenon and undoubtedly made some contribution to the picture observed.

If the S-body was at the altitude of 200 km, it could be seen at an angle of 6° 30' to the horizon from Helsinki, 10° from Leningrad, 13° from Sortavala, and 18° from Petrozavodsk. It is possible that just this body was observed from Lahta (near Leningrad) and also by those eyewitnesses in Leningrad who noticed a low altitude of the object above the horizon. Still, other observers disagree as regards the position of the S-body. The azimuth difference of 20°–30° from the S-body for the "Pulkovo object" can (with some probability) be explained as a result of observation errors, but the discrepancy between 60°–80° of elevation and 10° is obviously outside the range of possible errors. In Sortavala, where the object elevation was estimated by the meteorologists as 60°, this discrepancy is also too large. Some other features of the "Sortavala object" (as well as some features of the "Pulkovo object") make their identification with the S-body very problematic.

The most complicated is the situation in Petrozavodsk. The average direction to the object at the stage of its hovering (the azimuth of 40° and the elevation of 21°) is in excellent agreement with the position of the S-body (the azimuth of 44° and the elevation of 18°). Meanwhile, a large set of observations in Petrozavodsk (described by scenario 2) is totally inconsistent with the S-stage. The data on several objects seen there also contradict it. It is reasonable to presume one or two bodies observed in Petrozavodsk alongside with the S-body.

The picture that was observed in Lehta (Karelia) did not agree with the S-stage at all. We remind that the three successively appearing luminous objects were seen from Lehta in the NNW direction, while the S-body was at this time almost exactly to the east of Lehta (the azimuth of 75°). Interestingly, there was a remarkable spiral glow in this direction. It could be superimposed on the glow of the S-body, and this is why the latter was not identified.

The list of discrepancies between the S-stage and eyewitnesses' accounts could be continued. This suggests that during the main phase, at the points indicated in fig. 1, other luminous bodies were seen, apart from the S-body. At least, some of them seem to have been localized in the lower atmosphere, at an altitude of about 10 km. The low altitude makes it possible to understand why none of them has been photographed by the C–180 cameras. At the same time, localization of these bodies in the lower atmosphere seriously hampers interpretation of the phenomenon, having regard to the character of their motion (turns, hovering, movement against strong wind) and the possible mechanism of glow.

Since the main phase of the phenomenon had similar features when observed from many sites, it is reasonable to suppose that there was one source of the luminous bodies. However, its nature has remained unknown. Now that the picture of the event has become by and large clear enough, it becomes obvious that the early attempts to associate it with fall of a large bolide [2] were unfounded. Equally unfounded, in our opinion, were the attempts of explanation applying to the assumption of ball lightning [3]. First of all, it is hard to imagine almost simultaneous appearance of ball lightning phenomena over so vast a terrain, the more so that there were no thunderstorms in the observation regions at that time. It should be also remembered that even in the case of a distance to the luminous bodies in the order of 10 km (it was hardly smaller), the linear dimensions of the core were about 100 m, and the shell dimension was approximately 5 km. Ball lightning with so unique characteristics has not been known, to say nothing of other features of the phenomenon. It seems more appropriate to speak not of ball lightning, but of another type of plasma phenomena. However the possibility of the existence of such formations in the atmosphere is till now purely speculative. Some time ago, M.T.Dmitriev has proposed that the phenomenon of September 20, 1977 was a result of formation of chemiluminescence (CL) zones in the atmosphere [4; 5]. As M.T.Dmitriev thinks, these zones, having their own sources of chemical energy (which then transforms into luminous radiation), arise from break-through of stratosphere ozone into the troposphere. The ozone concentration close to the earth increases in this case by a factor of 100 or more, and the ion and electron concentrations increase by a factor of 10^3–10^6. M.T.Dmitriev believes that the CL zones account for a wide range of phenomena, including anomalous glow in day- and night-time (as the phenomenon of September 20, 1977), spurious radar returns ("ghosts" or "angels") and can also be the cause of inexplicable disappearance of airplanes (as that in the Bermuda Triangle region). All this seems quite hypothetical.

For one thing, the mechanism of formation of a CL zone is unclear. M.T.Dmitriev proposed that ozone break-through to the lower atmosphere took place "in the case of short time disappearance of the tropopause and formation of sufficiently intense air down-flows". We do not know to what measure this mechanism is realistic. It should be noted that on the 20th of September, 1977 there were observed no intense air down-flows in the area under consideration. The cause of temporary cessation of the tropopause is also unclear: Dmitriev does not discuss this question. His note that the glow in Petrozavodsk was accompanied by a "strong smell of ozone" does not seem quite convincing: in fact, none of the reports from Petrozavodsk which we know (over 70) mentions this. Another mechanism of formation of a CL

zone — enlargement of photochemical (nitrogen-bearing) aerosols and penetration of these from the stratosphere into the lower atmosphere — also needs more detailed reasoning. If we even assume (for some cause or other) abrupt increase of the concentration of active photochemical molecules in the troposphere, there still remains the problem of existence of a stable CL zone as a compact formation with the lifetime of up to one hour.

Our opinion is that recourse to the chemiluminescence mechanism for the explanation of anomalous glow in the atmosphere is legitimate. However, at present, it is premature to come to any general conclusion in this respect, because the hypothesis has not at all been developed, either qualitatively or quantitatively. In this context, it is deplorable that the above-cited papers proposed their explanations as scientifically trustworthy, without any hint of being hypothetical.

Coming back to the phenomenon of September 20, 1977, we have to admit that it had certain anomalous characteristics, for which it may not be explained in terms of well-known phenomena, like bolides, aurora borealis, or ball lightning. It is also hard to imagine a technical experiment of so large a scale, with so unique characteristics. We can only conceive a very uncertain assumption that when the magnetosphere is disturbed, some ordinary experiments could trigger off more powerful processes in the atmosphere. However such an assumption is too general and speculative, because the nature of these processes and the mechanism of their impact on the environment are still quite unclear. This can point to the trend of search, but does not provide explanation as such. As we think, the question of the nature of the phenomenon under consideration is still open. It is no wonder, because it has not been investigated thoroughly.

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(Editorial—continued from page 2)

The "soft" stage of ufological development seems now to have reached its highest point. What will be the next stage? I am inclined to suggest the "hard" one, but, to tell the truth, it depends (first of all, it probably depends on solution of the main quasi-ufological problem — the problem of ufological funding!) Anyway, ufology is a "living" system: it grows up, develops, sometimes falls ill, and one day in the future it shall come to maturity... if not become extinct. Now we appear to be at a point of bifurcation. Something is in the making.

References

[1]For details, see: Rubtsov V.V. UFOs: From Polemics to Research... and Back. — *Pursuit*, in press.

[2]Michel A. The Mouse in the Maze. — *Flying Saucer Review*, 1974, Vol. 20, No. 3, p. 8.

[3]Vallee J. Messengers of Deception. N.Y.: Bantam Books, 1980, p. 245.

[4]For instance, beginning from 1978, ufological books and journals sent to Soviet ufologists from abroad were regularly confiscated. Before, in spite of the severe prohibition for the letters "U.F.O." to appear on printed pages in the USSR, the same letters on the cover of a foreign book were a sort of password for the Soviet postal authorities.

[5]See, for example: Rodeghier M. What the GAO found: Nothing about much ado. — *International UFO Reporter*, 1995, Vol. 20, No. 4, p. 7.

[6]For more details, see: RIAP: Some Basic Data. — *RIAP Bulletin*, 1994, Vol. 1, No. 1.

— Vladimir V. Rubtsov

OBITUARY: DR. ALEXEY ZOLOTOV

As this RB issue goes to press, we learn, with great regret, about the tragic death of Dr. Alexey V. Zolotov, a renowned investigator of the problem of the Tunguska explosion. Contribution, made by Dr. Zolotov to this field of research cannot be overestimated. He has in fact introduced the "artificial" model of the Tunguska phenomenon (that was proposed by A.P.Kazantsev) into science. Dr. Zolotov has not only determined some essentially important characteristics of the phenomenon (see: RB, Vol. 1, No. 3–4, p. 2), but also made his results accessible for discussion, defending his Ph.D. thesis and publishing his scientific monograph on the Tunguska problem. It was not so easy, to say the least.

Dr. Zolotov was knifed by unknown (as yet) persons not far from his house in Tver, Russia, where he lived for the last 30 years. A few months ago his archives related to the Tunguska phenomenon were thrown away from a building that had formerly belonged to the Institute of Geophysics where Dr. Zolotov worked before retirement.

More about Alexey Zolotov and his life and work in one of our next issues.

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